THE DEPARTMENT OF NATURAL RESOURCES

mississippi geology

Bureau of Geology
2525 North West Street
Jackson, Mississippi 39216

Volume 4, Number 1
September 1983

Thoracosaurus neocesariensis (De Kay, 1842) (Crocodylia: Crocodylidae) from the Late Cretaceous Ripley Formation of Mississippi

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ABSTRACT

A complete skull with lower jaws and postcrania of the eusuchian *Thoracosaurus neocesariensis* are described. The specimen is from the Late Cretaceous Ripley Formation of north-central Mississippi. It is the most complete specimen of *Thoracosaurus* known from North America and shows that *Holopsisuchus (=Holops)* is a junior synonym. Furthermore, only one species, *T. neocesariensis,* is recognized in North America.

INTRODUCTION

Fossil vertebrates from the Late Cretaceous of Mississippi are not well known, possibly because of the paucity of exposures suitable for prospecting. Furthermore, many specimens which have been found are either in private collections or remain unstudied. Among the latter include numerous mosasaurs, turtles, and fishes at the Mississippi Museum of Natural Science, Jackson, and the Dunn-Seiler Museum, Mississippi State University, Starkville. Brief mention of Late Cretaceous vertebrates from the state was made by Stephenson and Monroe (1940), Lull and Wright (1942), and Horner (1979). More detailed descriptions have been given by Kaye and Russell (1973), Meyer (1974), and Carpenter (1982).

Most Late Cretaceous vertebrates from Mississippi come from marine strata. This is due mostly to the paucity of Upper Cretaceous terrestrial sediments as discussed by Stephenson and Monroe (1940).

Since Late Cretaceous vertebrates from Mississippi are so poorly known, any new specimen is potentially important. This is certainly true of the complete crocodilian skull, lower jaw and partial skeleton from the Ripley Formation in the fossil collections of the Dunn-Seiler Museum, Mississippi State University (MSU).

SYSTEMATICS

Class ARCHOSAURIA Cope, 1869
Order CROCODYLIA Gmelin, 1788
Suborder EUSUCHIA Huxley, 1875
Family CROCODYLIDAE Cuvier, 1807
Subfamily THORACOSAURINAE Nopcsa, 1928
Genus *THORACOSAURUS* Leidy, 1852
Thoracosaurus neocesariensis (De Kay, 1842)
Gavialis neocesariensis De Kay, 1842
Crocodylus (Gavialis) clavirostris Morton, 1844
Sphenosauchus clavirostris (Morton, 1844)
Crocodilus basifissus Owen, 1849
Crocodilus basitruncatus Owen, 1849
Crocodilus dekayi Leidy, 1852
Thoracosaurus grandis Leidy, 1852
Crocodilus obscurus Leidy, 1856
Crocodilus tenebrosus Leidy, 1856
Thoracosaurus brevispinus Cope, 1867
Holops brevispinus Cope, 1867
Holopsisuchus brevispinus (Cope, 1867)
Holops cordatus Cope, 1869
Holopsisuchus cordatus (Cope, 1869)
Holops glyptodon Cope, 1869
Holopsisuchus glyptodon (Cope, 1869)
Holops pneumaticus Cope, 1869
Holopsisuchus pneumaticus (Cope, 1869)
Thoracosaurus meirsanus Troxell, 1925
Thoracosaurus mullicensis Troxell, 1925

MATERIAL: MSU 3293 skull, jaws, four cervicals, eleven dorsals, two sacrals, six caudals, left scapula, left and right coracoids, right ilium, left ischium, left and right femur, and approximately forty-five scutes. Much of the postcrania is fragmentary.

OCCURRENCE: Ripley Formation, Oktibbeha County, Mississippi. Exact locality data on file at the Dunn-Seiler Museum, Mississippi State University. Collected by Steve Newman, 1973.

DESCRIPTION: The skull (Fig. 1, a-e; Fig. 2) is complete except for damage sustained during collecting and subsequent preparation. This has resulted in the loss of both quadrate condyles, right pterygoid, ectopterygoid, quadratojugal, and jugal (partially). The skull is slightly crushed dorsoventrally as indicated by the deformed braincase, longitudinal fractures in the jugal, and deformed postorbital bars. Crushing, however, has not resulted in much distortion of the pterygoid flanges.

The skull is long and slender, resembling those of the modern *Tomistoma schlegelii* and *Crocodilus cataphractus.* This is only superficial, however, and is due to the long narrow muzzle. Most of the skull surface is sculptured, especially the skull table.

On the dorsal portion of the rostrum, the paired premaxillae completely surround the external nares. The nares are considerably longer than wide, and are not divided by a bony septum as in *Osteolaemus* and *Alligator.* The premaxillae are raised at the posterolateral rims of the external nares, causing the nares to slope forward. As with most crocodiles, the muzzle is pinched at the premaxillary-maxillary suture to accommodate the third? and fourth? dentary teeth. Posterior to the external nares, the premaxillae form a midline wedge separating the maxillae. The premaxillae approach, but do not contact, the nasals. Ventrally, each of the premaxillae exhibit five teeth, the largest of which is the fourth. The large oval incisive foramen are almost as large as the external nares. As with the dorsal surface of the rostrum, the premaxillae form a midline wedge between the maxillae. This wedge extends posteriorly to about the distance between the third and fourth maxillary teeth.

The maxillae, which make up most of the rostrum, are separated anteriorly by a midline wedge of the premaxillae and posteriorly by a midline wedge of the nasals. The lateral margins of the maxillae are parallel for about half the length of the skull, after which they diverge. It is not known how many teeth were present in the maxillae because the posterior-most portion of each is damaged. There are at least twenty-three teeth and alveoli on the left maxilla, which is the more complete of the two. Most of the teeth or alveoli are widely spaced permitting an interfingering of the dentary teeth. Posteriorly, however, the alveoli and teeth are more closely set and lie with a groove. The toothed portion of the maxillae extend at least to below the middle of the orbits.

Both nasals are long slivers of bone which taper anteriorly separating the maxillae along the midline, and extend almost to the premaxillae. Posteriorly, they are separated by a medial wedge of the frontals. Sutures with the prefrontal are obscured by matrix, plaster and fractures.

The orbits are damaged, but between them it is possible to reconstruct their original shape as subtriangular, almost subrectangular. Sutural contacts for many of the preorbital bones are indistinct due to fractures, matrix and damage. It appears, however, that the lacrimals extend anteriorly from the front of the orbits and taper medially against the nasals. The sutural contact between the prefrontals and nasals is obscured. Laterally, the frontals form the posterolateral margins of the orbits, and posteriorly, the anteromedial border of the supratemporal fenestrae. Neither the prefrontals nor the frontals are raised around the orbits as in many crocodiles. The supratemporal fenestrae are large and oval, and are wider than long.

Figure 1. Skull and lower jaws of *Thoracosaurus neocesariensis,* MSU 3293. Skull in dorsal (a), ventral (b), and lateral (c) views; lower jaws in lateral (d) and dorsal (e) views. Abbreviations: an - angular; d - dentary; ec - ectopterygoid; f - frontal; j - jugal; l - lacrimal; mx - maxilla; n - nasal; p - parietal; pal - palatine; pf - prefrontal; pm - premaxilla; po - postorbital; pt - pterygoid; qj - quadratojugal; sa - surangular; sq - squamosal. Bar = 10cm.

The postorbitals connect the skull table to the cheeks via a descending process to the jugals. Dorsally, the postorbitals separate the orbits from the supratemporal fenestrae, and laterally, from the lateral (infratemporal) fenestrae. As in most eusuchians, the postorbital bar is recessed from the outer configuration of the skull.

Posterior to the postorbitals are the squamosals, which form most of the lateral margins of the skull table. Viewed dorsally, the squamosals are L-shaped and form the lateral and posterior margins of the supratemporal fenestrae. The posterolateral corners of the squamosals are elongate processes which overlap the inclined quadrate. A deep pocket, the external auditory meatus, is present ventral to the squamosal and posterior to the supratemporal fenestrae. The one on the right is damaged, and the one on the left is filled with matrix. However, it appears that both were similar to the external auditory meatus of other crocodiles. One minor difference is that the postorbital bar does not form the anterior limit, or margin, for the meatus as in *Crocodylus* and *Alligator.*

The squamosals contact the parietals posterior to the supratemporal fenestrae. The parietals form the medial part of the skull table between the supratemporal fenestrae. Thus, it forms the medial and part of the posterior rim of the supratemporal fenestrae. Unlike most crocodiles with large supratemporal fenestrae, the parietals are not narrow between the fenestrae. Little can be said about the contact between the parietals and the braincase due to crushing, collecting or preparation damage, and matrix.

The supraoccipital meets the parietals at the posteromedial margin of the skull table. This region is scalloped, a condition not previously reported for crocodiles. The spinalis capitus inserts at this point, but the functional reason for the scalloping is uncertain.

Laterally on the skull, the right jugal is damaged, but the left jugal is complete. Unfortunately, most of the sutures are indistinguishable, so it is not possible to determine the exact shape of the jugal. The posterior quadratojugal process of the jugal is not sculptured as in *Crocodylus,* but smooth as in *Alligator.*

Only the left quadratojugal is complete, but, unfortunately, it is not possible to delineate the sutures because of damage, matrix, and fractures. Likewise it is impossible to interpret the shape of the quadrates since they also are damaged and none of the sutures are visible.

Dorsoventral crushing has reduced the distance between the skull table and foramen magnum, resulting in the distortion of the exoccipitals and paroccipital processes. The back of the skull does not differ significantly from other crocodiles, except by being shorter above the foramen magnum. Crushing has considerably compressed the foramen magnum and distorted the braincase. Matrix and damage prevent any interpretation of the braincase elements.

On the palate, two very large triangular, suborbital fenestrae lie medial to the posterior part of the maxillae. These fenestrae are formed by the maxillae anteriorly and laterally, by the ectopterygoids and pterygoids posteriorly, and by the paired palatines medially.

The long and narrow palatines connect the maxillae with the pterygoids. Anteriorly, the palatines wedge between the maxillae; posteriorly, they underlap the pterygoids for a few millimeters.

Both pterygoids are damaged; the left one is almost complete except near the choanae. Damage and matrix obscure the sutural contact between the pterygoids and braincase. The pterygoid flange is large and is underlapped at the lateral margin by the descending process of the ectopterygoid. As in *Crocodylus, Tomistoma* and *Gavialis,* the posterior margins of the pterygoids lie at the same level as the lower edge of the basitubera. The posterior margin of the choanae is damaged, so it is not known if this region was crested as in alligators (Iordansky, 1973).

Both ectopterygoids are damaged, although the left one less so. It is triradiate and connects the maxilla with the pterygoid flange, the postorbital, and the jugal. The descending process, where it underlaps the pterygoids, is very long.

The lower jaws are complete and are articulated along a long symphysis. In profile, the dentaries are long and slender, except posteriorly where they deepen dorsoventrally. The tips of both dentaries are missing, but enough is preserved to determine a similar upturn as in the palatal portion of the premaxillae. Dorsally, the tips are laterally expanded to match the lateral configuration of the premaxillae. Near the

Table I. Measurements of *Thoracosaurus neocesariensis.*

	MSU 3293	*AMNH 2542*
1-23	*88.8cm*	
2-3	*2.3*	
1-9	*69*	
4-5	*4.8*	
6-7	*21.2*	
8-14	*8.4 (est.)*	
10-11	*6.9*	*3.2*
12-13	*7.7*	
15-16	*20.4*	*10.5*
17-20	*6.8*	*3.8*
18-19	*7.4*	*4.2*
21-22	*36.4 (est.)*	
24-33	*89.7*	
25-26	*4.1 (est.)*	
27-30	*19.9*	
28-29	*7.8*	
31-32	*42 (est.)*	
32-37	*63 (est.)*	
33-35	*35.2*	
34-36	*9.1*	

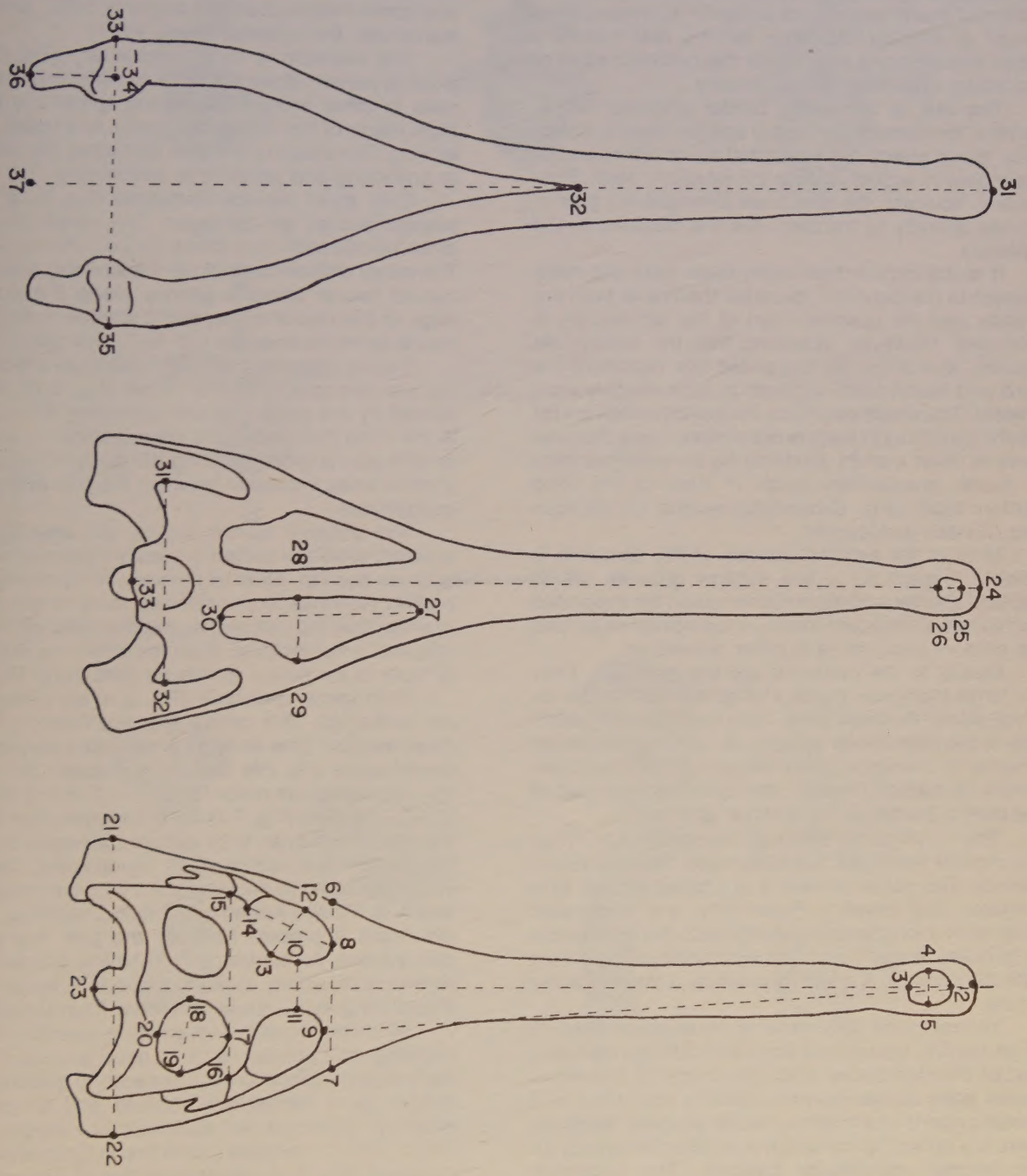

Figure 2. Location of measures given in Table 1.

middle of the expanded tips is a constricted diastema which receives the enlarged fourth premaxillary tooth. Just posterior to this constriction are a pair of closely set, subequal alveoli, which possibly accommodate the third and fourth teeth. Just posterior to these paired alveoli is another diastema for the first maxillary tooth; this diastema also marks the posterior edge of the lateral expansion of the dentary.

The rest of the dental border posterior to expanded tips consists of widely spaced alveoli. Anteriorly, these alveoli are separated by constrictions or scalloping to accommodate the maxillary teeth. Posteriorly, however, the alveoli are arranged in a groove formed laterally by the dentaries and medially by the splenials.

It is not certain how many teeth were originally present in the dentaries because the tips of both are broken and the posterior part of the left dentary is damaged. However, assuming that the closely set (paired) alveoli on the expanded tips represent the third and fourth teeth, 28 teeth in each dentary were present. The assumption that the paired alveoli are for the third and fourth teeth is not unreasonable because there is often a short diastema for an enlarged third or fourth premaxillary tooth in front of the third dentary tooth (e.g., *Crocodylus acutus, C. niloticus* and *Gavialis gangeticus).*

Most of the external surface of the dentaries is smooth, except for a few shallow grooves, which become shorter and more numerous on the expanded tip. Numerous nutrient foramina are scattered among the anterior grooves as in other crocodiles.

Medial to the dentaries are the splenials. They are large triangular plates and cover most of the internal side of the lower jaws. They contribute considerably to the mandibular symphysis, although the exact amount is unknown since the symphysis has been filled with plaster. Dorsally, the splenials form part of the medial border of the alveolar grooves.

The surangulars are large sheets of bone. They are slightly damaged, but fortunately the sutures are distinct. The dorsal surface is not broad and flat as in *Alligator,* but beveled. Posteriorly, the surangular extends in a long tapering wedge onto the retroarticular process. Anteriorly, it has an interfingering suture with the dentary. A small foramen is present near the suture.

Ventral to the surangular is the angular. This is a large, curved, trough-like bone which forms the lower part of the mandibular adductor fossa. The posterolateral edge curves dorsally forming the lateral and posterior parts of the retroarticular process. Medially, there is a dorsal flange which is notched anteriorly for the internal mandibular foramen. The coranoids should lie along the dorsal rim of the flange, but both were apparently lost prior to burial.

An external mandibular fenestra should occur on the external surface of the jaws because it is present in other eusuchian crocodiles. This region is damaged in both jaws, but based on sutural surfaces preserved on the surangulars, angulars and dentaries, it appears that there were, in fact, no fenestrae. A similar condition has previously been reported for thalattosuchians and some mesosuchians (Langston, 1973), and in the eusuchian, *Bernissartia* (Steel, 1973).

The skeleton is very fragmentary (Fig. 3, a-k). What is present does not differ significantly from that seen in other crocodiles. Neural spines are broken from many of the vertebrae, partly as a result of collecting. Some centra are also damaged, partially due to collecting and partially to weathering.

Only three cervical vertebrae (Fig. 3, a, b) are present and all are damaged. The vertebrae do not differ significantly from those of *Crocodylus niloticus.* The minor differences include the tapering, posteriorly curved neural spine, a groove along the posterior edge of the neural spine, and a shallow fossa on the neural spine between the pre- and postzygapophyses.

Twelve dorsal vertebrae (Fig. 3, c, d) are present, but are damaged. The first dorsal (Fig. 3, c), characterized by the great laterally extending diapophysis, is the most complete. The neural spine curves posteriorly and is grooved along the posterior margin. A shallow fossa is present between the pre- and postzygapophyses.

The anterior dorsal centra are laterally compressed, while the posterior ones are transversely oval in cross-section. Most of the vertebral processes are broken. However, two vertebrae are complete enough to show that the transverse process extends horizontally and is not inclined. Both the anterior and posterior faces of the neural spines are grooved or flattened.

Both sacral vertebrae (Fig. 3, e) are present, but are damaged. The centra are transversely oval in cross-section. One vertebra preserves a portion of the neural spine and this is slightly grooved. Except for this, the vertebrae differ little from *Crocodylus.*

Six caudals (Fig. 3, f) are in the collection, including the bi-condylar first. All are damaged and only one preserves a portion of the neural spine. The spine is too damaged to determine if it was grooved or flattened, or if it was keeled as in other crocodiles. A shallow fossa is present between the pre- and postzygapophyses. All centra have a shallow groove on the ventral side which extends the entire length. Little else distinguishes these vertebrae from *Crocodylus.*

All appendicular and girdle elements are fragmentary and appear to have been exposed on the surface when discovered. The pectoral girdle is represented by a partial left scapula and a complete, although damaged, left coracoid. The scapula is too incomplete to compare it with that in *Crocodylus.* The coracoid (Fig. 3, g) differs from that in *Crocodylus* in being long and slender; otherwise it is similar. None of the forelimb elements is preserved.

Of the pelvic elements, only the left ilium (Fig. 3, h) and ischium are present. Both are damaged, but show some differences compared to *Crocodylus.* The pre-

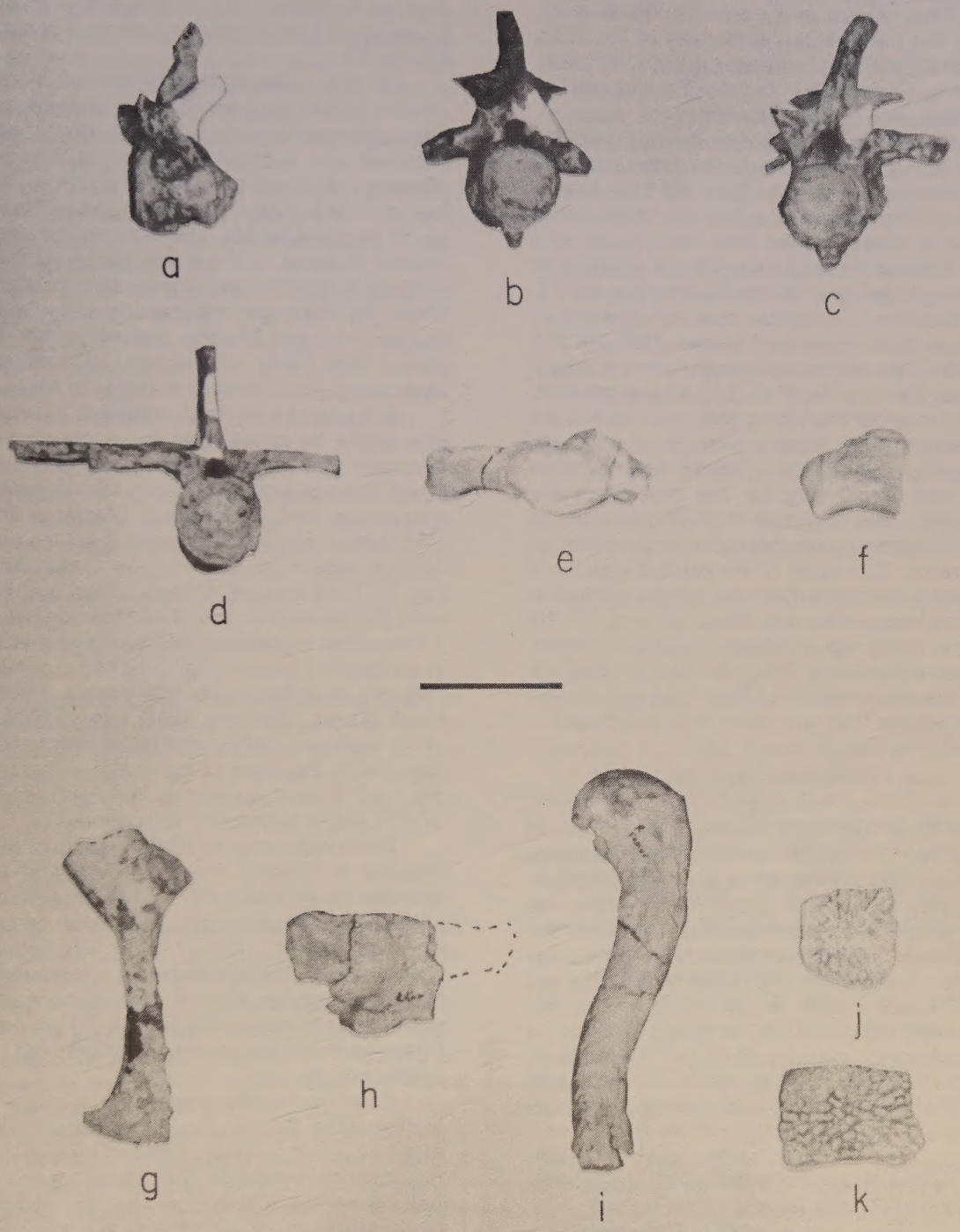

Figure 3. Postcrania of *Thoracosaurus neocesariensis,* MSU 3293: cervical 4? in lateral view (a); cervical 7 in anterior view (b); thoracic 1 in anterior view (c); posterior thoracic in anterior view (d); sacral in anterior view (e); anterior caudal in lateral view (f); left coracoid in ventral view (g); left ilium (h); right femur (i); square cervical? scute (j); rectangular dorsal scute (k). Bar = 10cm.

acetabular portion of the ilium is more squared than triangular due to a dorsal and ventral thickening of this region. This results in a deeper pre-acetabular notch below the pre-acetabular portion of the ilium. An additional difference is a deeper acetabular fossa. The ischium is fragmentary, but does not appear to differ from that seen in *Crocodylus.*

Both femora are present, but neither is complete. The right (Fig. 3, i) one lacks only the distal end, and shows that the shaft was more sigmoid than that of *Crocodylus.* On the ventral side, anterior to the fourth trochanter, is a raised rugose area reminiscent of a scar left by insertion of a muscle. This is interpreted to be for the pubo-ischio-femoralis internus part 1, despite the fact that this muscle inserts in this region as a long sheet in *Alligator* (see Romer, 1923, Pl. 25).

About forty-five scutes are present, most of which are damaged. Two types (Fig. 3, j, k) are present, some which are wider than long,and some which are equi-dimensional. None show a medial keel, although most are slightly domed. Many have a beveled edge along one side, apparently for the overlap of the foreward scute. This suggests that *Thoracosaurus* was covered dorsally by an extensive armor cover as in anguid lizards. Curvature of the scutes, which are wider than long, indicates that they were arranged in transverse bands across the back. Pitting of the scutes is large and irregular. Some pits may connect, producing an elongate or figure 8-shaped pit. On a few scutes the pits seem to radiate from the center, but on most scutes they are randomly distributed.

DISCUSSION

MSU 3293 is the most complete specimen of *Thoracosaurus* from North America, and confirms that *Holopsisuchus (=Holops)* is a junior synonym as suggested by Troedsson (1924). Furthermore, the characters which have been used to establish the various species of *Thoracosaurus* and *Holopsisuchus* in North America are within the range of variation and allometric changes among extant species of crocodiles (e.g., Mook, 1921; Dodson, 1975; and *Crocodylus niloticus* and *Alligator mississippiensis* in the University of Colorado Museum). This suggests that only one species of *Thoracosaurus, T. neocesariensis,* should be recognized in North America.

Thoracosaurus neocesariensis was originally named as a new species of *Gavialis* by De Kay in 1833 for lower jaw fragments from the Cretaceous Greensands of New Jersey. The genus, on the other hand, was established by Leidy in 1852 for a large scute also from the Greensands which he named *Thoracosaurus grandis.* Leidy (1865) later redescribed a skull from the Greensands previously described by Morton (1844) as *Crocodylus (Gavialis) clavirostris.* It appears that Leidy was not aware of Morton's brief description since no mention is made by Leidy. However, comparison of Morton's figure of the skull with that of Leidy shows them to be one and the same. Leidy states the skull to be in the collections of the Academy of Natural Sciences, but it is actually at the National Museum of Natural History where it is catalogued as USNM 72.

Leidy's redescription of the skull was accompanied by comparisons to *Gavialis.* He concluded that although there were similarities, all of the Greensand material was sufficiently different from *Gavialis* to warrant a different generic designation. He proposed that all of the material be assigned to *Thoracosaurus* as *T. neocesariensis.* His reasons for assigning the cranial material to the same genus as the scute are not well defined since scutes were not associated with either the jaw fragments described by De Kay or with the skull he and Morton described. Nevertheless, it seems that Leidy was correct as indicated by the associated skull, jaws and armor of MSU 3293.

The use of a scute to establish a genus of crocodile might be challenged by some, but it must be admitted that little work has been done in this area. Scutes can be used to distinguish *Alligator, Allognathosuchus,* and *Crocodylus.* Wermuth and Mertens (1961) have shown that cervical scutes differ among various extant crocodiles (see Carpenter, in press, Fig. 1). Furthermore, O'Neil, Lucas and Kues (1981) used the unusual scutes of *Akanthosuchus* to separate it from other crocodiles. Scutes may prove to be useful in crocodile taxonomy (at least to the generic level) as they are in ankylosaurs (Carpenter, 1982; in press), fossil lizards (Gilmore, 1928; Estes, 1964; Meszoely, 1970; Sullivan, 1979), and glyptodonts (Gillette and Ray, 1981). Because of the great similarities between the type *Thoracosaurus grandis* and scutes of MSU 3293, Leidy's synonymy is accepted.

The synonymy of *Holopsisuchus* with *Thoracosaurus* is based on a comparison of the type *H. brevispinus* with MSU 3293. The type skull *H. brevispinus* has been damaged and prepared further since figured by Cope (1869, Pl. 1, fig. 13). Except for slight differences in the shape of the supratemporal fenestrae and smaller size of *Holopsisuchus,* no major differences between the two skulls were discovered. Likewise there are no major differences in the postcrania and scutes.

Cope originally separated *Holops (=Holopsisuchus)* from *Thoracosaurus* on the basis of a lacrimal foramen in the latter. Reexamination of the skull (USNM 72) indicates that these openings are not natural and are therefore neither openings for a lacrimal gland (or salt gland), nor the remains of an antorbital fenestra. These holes may have been made when the skull was found or during subsequent preparation. In any case, no crocodile, living or extinct, is known to have a lacrimal fenestra. Therefore, *Holopsisuchus (=Holops)* is considered a junior synonym of *Thoracosaurus.*

Several species of *Thoracosaurus* and *Holopsisuchus* were established on fragmentary postcrania.

This material was assigned to one genus or the other primarily on the basis of size: large bones to *Thoracosaurus,* and small to *Holopsisuchus.* Since no morphological criteria can be found to separate these species from MSU 3293, they are considered to represent various ontogenetic stages of *Thoracosaurus neocesariensis* with the realization that dimorphic size variation may also be present.

Fossil crocodile taxonomy is based primarily upon cranial characters. The unusually complete skull of MSU 3293 permits a re-evaluation of *Thoracosaurus neocesariensis.*

Only one other species of *Thoracosaurus* is represented by good cranial material. This is *T. scanicus* Troedsson, 1924, from the Late Cretaceous of Sweden (Andrews (1906) correctly placed *Thoracosaurus macrorhynchus* in *Tomistoma* because of the contact of the nasals with the premaxillae). *T. neocesariensis* differs from *T. scanicus* in the more anterior extension of the nasals, the lacrimals tapering against the nasals, the broader interorbital region, the longer anterior wedge of the frontals between the nasals, the straight palatine-pterygoid suture (V-shaped in *T. scanicus*), and the larger, more posteriorly extending pterygoid flanges.

REVISED DIAGNOSIS

T. neocesariensis: a species of *Thoracosaurus* in which the nasals extend very far forward, almost to the premaxillae; very long anterior wedge of the frontals; a very broad interorbital region; a straight palatine-pterygoid suture; and very large pterygoid flange.

CONCLUSIONS

The new *T. neocesariensis* skull and skeleton permits a re-evaluation of a poorly known Late Cretaceous crocodile. Many specimens are known, mostly in the collections of the American Museum of Natural History and the Yale Peabody Museum, with smaller collections at the Philadelphia Academy of Natural Sciences and the National Museum of Natural History. Unfortunately, all of this material is very fragmentary and has been used as types without regard to variation or allometric growth. It is clear now that only a single species of *Thoracosaurus, T. neocesariensis,* should be recognized in the Late Cretaceous of North America.

ACKNOWLEDGMENTS

I would like to thank Ernest E. Russell, Mississippi State University, for inviting me to study and describe the *Thoracosaurus* specimen. Thanks also to David Dockery, Mississippi Bureau of Geology, who brought the skull to my attention and who assisted in its transportation, and to Judith Harris, University of Colorado Museum, for comments and suggestions.

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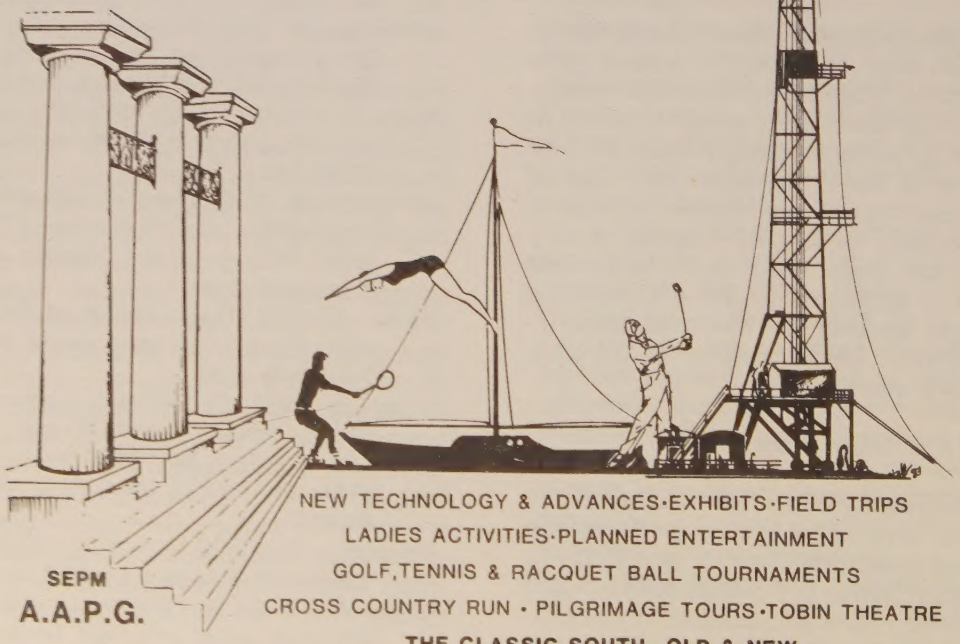
Attend! 33rd Annual
Gulf Coast Association of Geological Societies
CONVENTION ...1983
JACKSON, Mississippi
October 25-28

Host: Mississippi Geological Society
P.O. Box 369 Jackson, Mississippi 39205



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CALENDAR OF EVENTS

1983 October - December

October 2-7 - Cretaceous climates, a Penrose Conference and field trip by the Geological Society of America, Florissant, Colorado. (Eric Barron, National Center for Atmospheric Research, Box 3000, Boulder, Colorado 80307)

October 3-8 - Association of Engineering Geologists, annual meeting, San Diego. (Dennis L. Hannan, Leighton & Associates, 7290 Engineer Road, Suite H, San Diego, California 92111. Phone: 619/292-8030)

October 25-28 - Gulf Coast Association of Geological Societies, 33rd Annual Convention, Gulf Coast Section, Society of Economic Paleontologists and Mineralogists, Jackson, Mississippi. (John C. Marble, Forest Oil Corporation, 111 E. Capitol St., Suite 500, Jackson, Miss. 39201. Phone: 601/354-1916)

October 31 - November 3 - Geological Society of America, annual meeting, in Indianapolis, with associated societies: Cushman Foundation, Geochemical Society, Geoscience Information Society, Mineralogical Society of America, National Association of Geology Teachers, Paleontological Society, Society of Economic Geologists. (Arthur Mirsky, Dept. of Geology, Indiana University/Purdue University, 925 W. Michigan St., Indianapolis, Indiana 46202. Phone: 317/264-7484)

November 11-12 — Alabama Geological Society, annual field trip, eastern Alabama. (Thomas J. Carrington, Dept. of Geology, Auburn University, Auburn, Alabama 36830. Phone: 205-826-4282)

December 5-9 — American Geophysical Union, fall meeting, San Francisco, (A.G.U. headquarters, 2000 Florida Ave. NW, Washington, D.C. 20009. Phone: 202/462-6903)

PETROLEUM NEWS

MISSISSIPPI OIL AND GAS STATISTICS, FIRST QUARTER 1983

Oil

	Bbls. Produced	Severance Tax	Average Price Per Bbl.
January	2,252,338	$ 3,585,034.12	$ 26.53
February	3,721,066	5,998,890.70	26.87
March	2,365,525	3,722,637.23	26.23
Totals	8,338,929	$ 13,306,562.05	$ 26.60

Gas

	MCF Produced	Severance Tax	Average Price Per MCF
January	8,227,747	$ 2,236,015.22	$ 4.53
February	32,664,310	7,946,266.19	4.06
March	13,919,087	3,543,756.04	4.24
Totals	54,811,144	$ 13,726,037.45	$ 4.18

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Editors: Michael B. E. Bograd and David Dockery
Typesetter: L. Michele Morphis